Innovations in Public Health Surveillance:
The National Bioterrorism Syndromic Surveillance Demonstration Project

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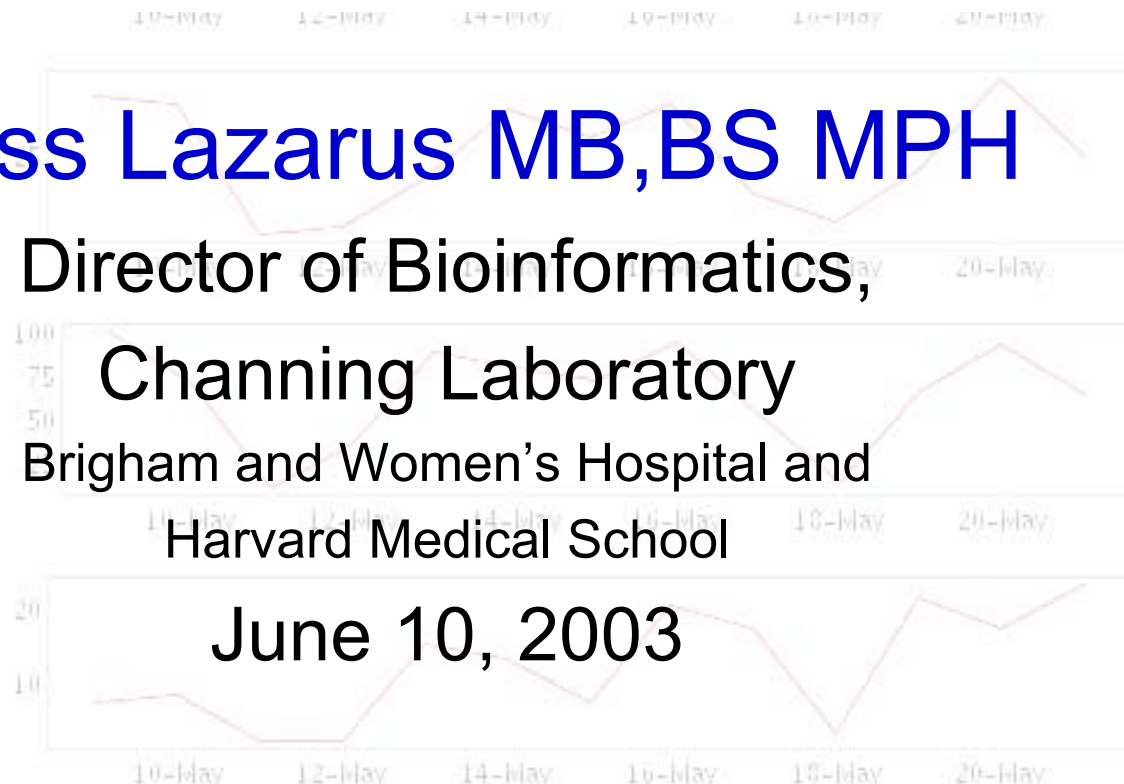Director of Bioinformatics,

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Brigham and Women's Hospital and

Harvard Medical School

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Outline

- ◆ Electronic records for surveillance
- ◆ Syndromic surveillance for BT
- ◆ HPHC/MDPH System
- ◆ National Demonstration Project
- ◆ Issues and challenges
- ◆ Lessons

Electronic records for surveillance

- ♦ BT - timeliness is crucial
- ♦ EMR potentially "real time" with Dx
- ♦ Increasingly available
  - ♦ Large group practices, HMOs
- ♦ Low marginal cost
  - ♦ Already in a database somewhere
- ♦ "Value add" - eg BT surveillance

Syndromic Surveillance for BT

♦ First signs - non-specific prodrome

♦ ICD highly specific/granular

 ♦ Clinician coding styles

 ♦ Systematic coding influences

♦ Aggregate ICD into broad syndromes

♦ Currently 12 - eg "Respiratory Infection"

♦ HPHC proof of concept

Bioterrorism Surveillance

Boston Bioterrorism Surveillance Daily Reports

Select from the list of pages below by clicking on the link of interest.
Please note that links marked "(Private)" require a valid UserID and Password.

(Private) View the reports of daily syndrome episodes for greater Boston
Publication about detection of acute illness clusters (Emerging Infectious Diseases)
Publication about syndromic surveillance methods (BioMed Central)
Preprint - article in press at JUH on using minimally identifiable data for syndromic BT surveillance

http://btsurveillance.org

Public web site with access to publications and information about the project

suggestions or enquiries may be directed to Ross Lazarus, infectious Disease and Epidemiology related enquiries to Rich Platt, statistical questions to Ken Kleinman, questions about report programming and Epicare interface to Inna Dashevsky

If you have been assigned a userid and password for this site, you may click on the "View the reports" link above, then type these into the authentication dialogue box to identify yourself to gain access. Please use the link at the bottom of this page to contact the Webmaster if you have been assigned a UserID and password but are experiencing technical difficulties accessing the site. We regret that technical support may not be available outside normal business hours (Local time when you loaded this page was 2003/04/22 10:17:11.3124 GMT-4).

Please direct any requests for access to the material to the project Administrative Officer,

Please note that your IP address (170.223.248.136) and all your activity on this website is logged.
If this is not acceptable, please disconnect immediately

Bioterrorism Surveillance

Boston Bioterrorism Surveillance Daily Reports

Massachusetts Department of Public Health
Daily Public Surveillance Report of Office Visits
With Diagnoses Corresponding to Infection Syndromes
Previous 30 Days Only. Click here to see the entire period

Click on a date (eg **Monday, 21 April, 2003**) to see a Summary report.
Click on an individual syndrome colored rate bar for a detailed syndrome report and map.
URI=Upper Respiratory Infection, LRI=Lower Respiratory Infection, UGI=Upper Gastrointestinal Infection, LGI=Lower Gastrointestinal Infection

http://btsurveillance.org

Regular daily reports
since October 31 2001

(Authorized users only)

Tuesday, 01 April, 2003					1.511
Monday, 31 March, 2003					1.597
Sunday, 30 March, 2003					0.448
Saturday, 29 March, 2003					0.510
Friday, 28 March, 2003					1.228
Thursday, 27 March, 2003					1.271
Wednesday, 26 March, 2003					1.400
Tuesday, 25 March, 2003					1.370
Monday, 24 March, 2003					1.941
Sunday, 23 March, 2003					0.485

Bioterrorism Surveillance

Boston Bioterrorism Surveillance Daily Reports

Wednesday, 14 November, 2001 <Prev   Up to Dates   Next> Friday, 16 November, 2

Back to Summary page

lri syndrome by census tract

http://btsurveillance.org

Next day daily results from Generalised Linear Mixed Models – P values for major syndromes

(Authorized users only)

Swampscott	250092021	2	335	0
Arlington	250173563	2	498	0
Wellesley	250214044	2	650	0

Swampscott, 2022, 3 ca

* The 5 most extreme tracts are shown, plus all with counts not expected to occur more than once per month.
^ Estimated number of years between daily counts this extreme in

Wellesley, 4044, 2 cases   Quincy, 4171, 2 cases

Done   Internet

Linelist for Monday, 2 June 2003
For use only by Mass. Dept. of Public Health personnel
Not for distribution

Syndrome	Visit ID#	Age	Sex	Temp	Diag at the visit	Diagnosis Description	Enc. Type	Patient ZIP code
URI/TEMP>=100	161	9	F	100.3	034.0	STREP SORE THROAT	Visi	
URI/TEMP>=100	162	39	F	100.1	034.0	STREP SORE THROAT	URGE	
DERM	28	73	F	.	733.00	OSTEOPOROSIS NOS	Visi	
DERM	123	71	F	.	287.5	THROMBOCYTOPENIA NOS	Tele	
DERM	79	87	F	.	787.91	DIARRHEA	Visi	
DERM	79	87	F	.	401.9	HYPERTENSION NOS	Visi	
DERM	79	87	F	.	287.2	PURPURA NOS	Visi	
DERM	79	87	F	.	569.42	ANAL OR RECTAL PAIN	Visi	
DERM	79	87	F	.	715.90	OA NOS-UNSPEC	Visi	
DERM	192	86	F	.	287.5	THROMBOCYTOPENIA NOS	Tele	
DERM	49	31	M	.	782.7	SPONTANEOUS ECCHYMOSES	Visi	

http://btsurveillance.org

Detailed individual records on line for immediate access

(Highly restricted authorized users only)

National Demonstration Project

- Electronic health records
- Office visits, nurse telephone triage calls
- ~20 million people.
- 50 states.
- Distributed processing
- Centralized reporting
- Syndrome count data only
- HIPAA "deidentified" (statistician's cert.)

National BT Demo Program

Optum 11/02

- 🟥 1-50
- 🟩 51-250
- 🟦 251+
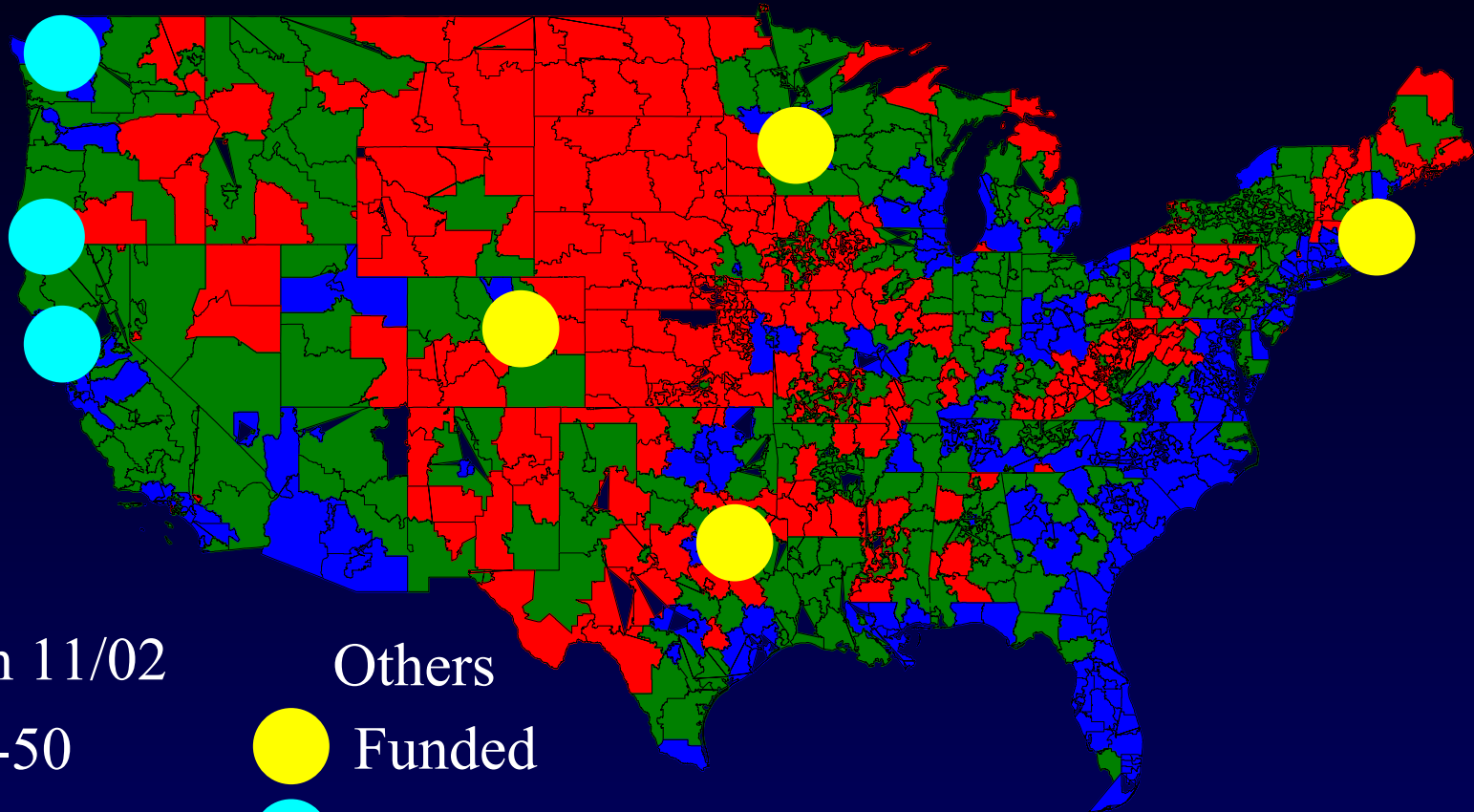
Others

- 🟡 Funded
- 🔵 Pending or in discussion

National Demonstration Project design features

- ♦ Scalable, data from many sources.
- ♦ Health plans put data extracts on a PC they control for processing.
- ♦ Analysis and reporting programs provided by data center.
- ♦ Internet-based communication.
- ♦ Encounter-level data stays with health plan or provider until health department requires it.
- ♦ Adaptable to other public health uses.

Surveillance strategy

- ♦ Extract encounters with an ICD9 code of interest.
- ♦ Initially daily. Potentially more frequently
- ♦ Group encounters into syndromes.
- ♦ Identify INITIAL visit for each episode of illness.
- ♦ Map episodes to the patient's home ZIP code initially
- ♦ Geocoding -> census tract when available
- ♦ Transfer summary data to data center
- ♦ Identify statistically "extreme" regions each period.
- ♦ Notify data provider and public health agency.

File Tools Process Membership Utilities Help

Tuesday, April 22, 2003

Go to Today

◀ April 2003 ▶
Sun Mon Tue Wed Thu Fri Sat
30 31 1   2   3   4   5
6   7   8   9   10 11 12
13 14 15 16 17 18 19

22/04/2003 10:45:46: natdemobtconsole.py started
22/04/2003 10:45:46: Read in 43295 zip codes
22/04/2003 10:45:46: http://www.time.gov contacted.

Identifiable data is all processed locally using software provided by the Datacenter

Identifiable lists of encounters available locally to be passed on in case of an event.

XML file, counts by zip by period only to Datacenter

20	20	Fever	04/10/2003:*New*	1 to 4	M	Charlestown:02125	VIS	None	U	2	KEN
21	21	Fever	04/10/2003:*New*	1 to 4	F	Randolph:02368	VIS	None	U	0	BTR
22	22	Fever	04/10/2003:*New*	1 to 4	F	Cambridge:02138	VIS	None	U	1	SOM
23	23	Fever	04/10/2003:*New*	1 to 4	F	Quincy:02169	VIS	None	U	2	BTR
24	24	Fever	04/10/2003:*New*	1 to 4	M	Waltham:02451	VIS	None	U	1	WEL
25	25	Fever	04/10/2003:(Last 09/April/2003)	1 to 4	F	Everett:02149	VIS	None	U	1	SOM
26	26	Fever	04/10/2003:*New*	1 to 4	M	Somerville:02145	VIS	None	U	0	SOM
27	27	Fever	04/10/2003:*New*	5 to 12	F	Wilmington:01887	VIS	None	U	1	PBY
28	28	Fever	04/10/2003:*New*	5 to 12	F	Chelsea:02150	VIS	None	U	2	SOM
29	29	Fever	04/10/2003:*New*	5 to 12	F	Saugus:01906	VIS	None	U	1	SOM
30	30	Fever	04/10/2003:*New*	5 to 12	M	Dorchester:02125	VIS	None	U	1	CH
31	31	Fever	04/10/2003:(Last 10/April/2003)	5 to 12	M	Milton:02186	VIS	None	U	0	BTR
32	32	Fever	04/10/2003:*New*	5 to 12	F	Watertown:02472	VIS	None	U	0	SOM
33	33	Fever	04/10/2003:(Last 02/March/2003)	1 to 4	F	Cambridge:02139	VIS	None	U		SOM

Display updated

XML - counts to Data Center

```xml
<Period>
  <startTimeStamp>2003-04-10T01:00:00-05:00</startTimeStamp>
  <endTimeStamp>2003-04-11T00:59:59-05:00</endTimeStamp>
- <geography TYPE="ZIP">
  <geovalue>01463</geovalue>
- <syndrome TYPE="Respiratory">
- <payer NAME="PR">
  <count>1</count>
  </payer>
  </syndrome>
  </geography>
- <geography TYPE="ZIP">
  <geovalue>01527</geovalue>
- <syndrome TYPE="Hemorrhagic">
- <payer NAME="PR">
  <count>1</count>
  </payer>
  </syndrome>
  </geography>
- <geography TYPE="ZIP">
  <geovalue>01581</geovalue>
- <syndrome TYPE="Fever">
- <payer NAME="PR">
  <count>1</count>
  </payer>
  </syndrome>
```
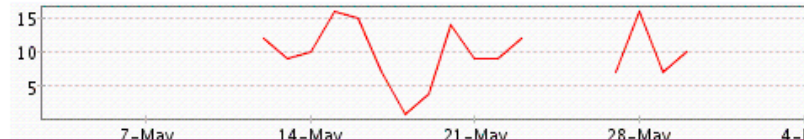
National Bioterrorism Syndromic Surveillance Demonstration Project

This is an experimental display
showing all counts from all data providers for the last 30 days
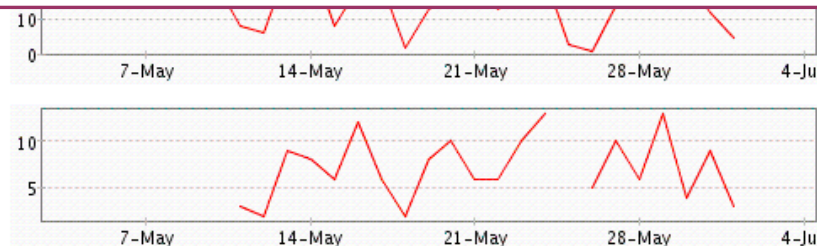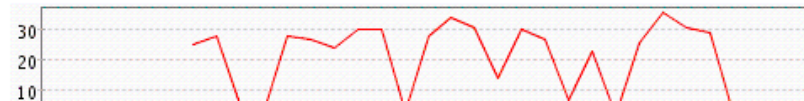**Show Previous YEAR**

Botulism-like

Data viewable as time series within minutes of arrival at datacenter

GLMM being run as historical data becomes available.

Lymphatic

Neurological

Outline

- Electronic records for surveillance
- Syndromic surveillance for BT
- HPHC/MDPH System
- National Demonstration Project
- **Issues and challenges**
- Conclusions

Issues: non-technical

- ◆ Surveillance data model
  - ◆ Traditionally centralized identifiable
  - ◆ Alternative - only counts centralized
- ◆ HIPAA
- ◆ Privacy/Security
- ◆ Authentication & administration
- ◆ Data presentation, visualization
- ◆ User interface for ad-hoc queries
- ◆ Notification - who, how, when

Issues: technical

- Noisy data!
- "Optimal" models
- ICD9 granularity $\Rightarrow$ Syndromes
- "Optimal" syndromes & ICD9 mapping
- Standards for data exchange - XML
- Authentication and access control
- Security for internet services - SSL

Overcoming challenges

♦ Shared definitions - CDC led workgroup

♦ Ad hoc queries.

♦ CDC PHIN/NEDSS compliance

♦ Open source infrastructure

♦ Open standards

♦ Open source code

Lessons

- ◆ EMR works for timely surveillance
- ◆ Distributed processing model works
- ◆ Design for additional data sources
- ◆ Standardized syndromes
- ◆ Standardized data exchange
- ◆ Strong encryption
- ◆ Best security practices

Collaborators

- ♦ Richard Platt
- ♦ Ken Klienman
- ♦ Inna Dashevsky
- ♦ Katherine Yih
- ♦ Courtney Adams
- ♦ Virginia Rego

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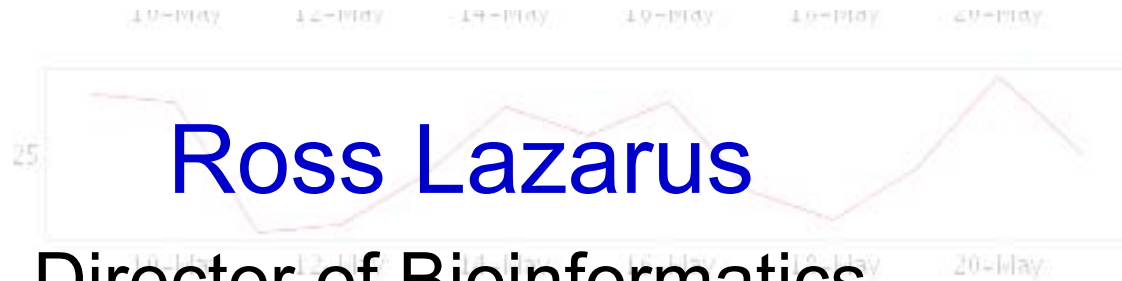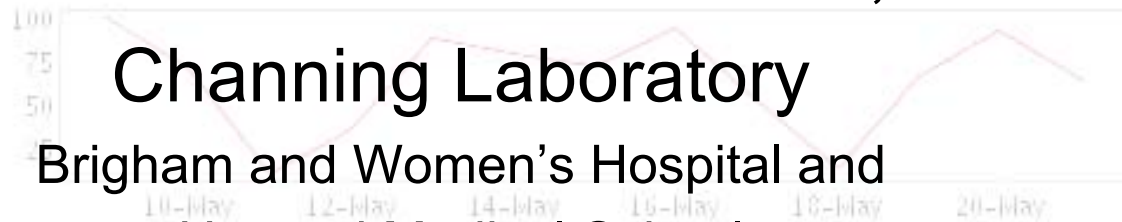### Director of Bioinformatics,

Channing Laboratory

Brigham and Women's Hospital and

Harvard Medical School

June 10, 2003

Data flow

Provider / health plan:
assigns diagnoses during encounter,
extracts selected encounters nightly,
identifies new episodes,
assigns to zip code.

More data as needed

Linelist

Health department

Count by zip

Instruction to send linelist to health dept.

Alert! Cluster type, size, location.

Data center:
aggregates data from different providers,
identifies unusual clusters

Website:
Public areas
Private areas